XIX. *Further Obſervations on the Wheat Inſect, in a Letter to the Rev. Samuel Goodenough, LL.D. F.R.S. Tr.L.S. By Thomas Marſham, Eſq. Sec. L. S.*

Read February 6, 1798.

Dear Sir,

THE very imperfect knowledge that we gained of the wheat inſect in the year 1795, which through you was communicated to the *Linnæan Society*, who have honoured it with a place in the Third Volume of their *Tranſactions*, has ſtimulated me to purſue the enquiry with greater earneſtneſs, though not with additional zeal; for it has always been my invariable opinion, that the enriching of a cabinet with the works of the creation is but a ſecondary conſideration at beſt, and of little utility, unleſs an endeavour to inveſtigate their nature, œconomy, and properties, be provoked by it. Indeed I often lament, that my ſituation in the metropolis, and the few opportunities I have of enjoying the country, prevent me from purſuing my favourite ſtudy as fervently as I could wiſh. In the preſent caſe I conſider myſelf only as the firſt inſtitutor of an enquiry that has become important by the perſevering aſſiduity and accurate examination of our mutual friends, to whom I was ſo much indebted in the former caſe. Early in June 1797, I wrote both to Mr. Kirby and Mr. Markwick, requeſting that they would again turn their attention to the wheat fields, and examine the ears of that grain as they advanced, from the firſt appearance of

of the flower, until the ſeed was ripe; and the reſult of their unremitted endeavours, with a few of my own obſervations, I now lay before you, requeſting, that if you think them worthy their attention, you will preſent them to our valuable Society; for ſuch I think it may be truly ſtyled, ſince the opinion of the Public has ſo fully ſtamped its conſequence.

Mr. Markwick, in a letter to me dated the 17th July 1797, ſtates as follows:—"On the 12th of this month I firſt diſcovered ſome of the little flies (which I ſend you incloſed) ſitting between the huſks or clefts of the ears of wheat: the next day they appeared to me more abundant; and then, for the firſt time, I found a few of the ſmall yellow larvæ, which infeſted the wheat in the year 1795, ſitting cloſe to the ſtamina, exactly as they are repreſented in the 3d vol. of the *Linnæan Tranſactions*, page 251. Tab. 22. fig. 10. a; ſince that time I have found the larvæ in much greater abundance, and the fly is alſo to be ſeen, though I think not in ſuch great numbers. The other inſects which I have diſcovered on the wheat, are the *Thrips phyſapus*, in its larva and perfect ſtate, as in the year 1795; and ſome of the ears were infeſted with the plant louſe *(Aphis)* called here the Dolphin." On the 25th of July, I received alſo a letter from Mr. Kirby, that contained ſome valuable hints, which induced me to ſend a copy of it to Mr. Markwick; and on the 17th of September I was favoured with the following letter from that gentleman:—

"I want words to expreſs the pleaſure I received from your laſt letter, as well as from your obliging communication of that of your very ingenious and learned friend Mr. Kirby, and ſhould have acknowledged the obligation ſooner, but waited until the end of harveſt, with the ill-founded hope of having ſomething to communicate relative to our little inſect worthy of your notice; for I am ſorry to ſay,

that I have not had any ſucceſs in diſcovering the perfect ſtate of this inſect: however, I will relate exactly what has happened.

" I incloſed ſeveral ears of wheat, containing a number of the ſmall yellow larvæ, in a flower-pot, cloſely ſtopped at the bottom, and covered with gauze at the top; and have at different times found dead, at the bottom of the pot, two different ſorts of very ſmall flies, one of which was a ſhort thick black fly, with very long tranſparent wings, and long ſlender ſmooth antennæ, of which I have ſent two rude figures ſomewhat magnified, ſee Tab. xix. No. vi. fig. 1. a and b. The other fly was as minute, if not leſs, with a yellow body, ſpotted and tranſparent wings, and long jointed antennæ, beſet with ſmall hairs or briſtles at each joint, at leaſt ſo they appeared to me through a magnifying glaſs; but that you may, if you pleaſe, examine them yourſelf, I have ſent two along with the others, being all that I found of that kind, though I fear they are not in a good ſtate; and I have alſo incloſed ſuch figures as I was able to make of them, ſee Tab. xix. No. vi. fig. 2, a and b. To your learned friend's queſtion as to the quantity of miſchief done by this unknown fly, I fear I cannot give a ſatisfactory anſwer: I certainly think his average of two grains in each ear deſtroyed by this inſect not too great, for I ſcarcely examined any ears in which there were not more than that injured. But, after all, are not our fears with reſpect to the injury that the wheat has received from this inſect greater than they ought to be? and does not the wheat ſuffer as much from inſects or ſome other cauſe every year, even in thoſe years that are moſt productive?

" By what I can learn from enquiries, and from my own obſervation, there is a good crop of wheat in this neighbourhood: one farmer, who has begun to threſh out his wheat, has found it yield well; and when in my own field I had the curioſity to rub out a few ears, and

and to count the number of grains in each, in none I found fewer than forty, and in one ſixty-two; nay, my ſervant found one with ſeventy grains, moſt of which were perfect, there being only three or four ſhrivelled in each ear—a proof, I hope, that notwithſtanding the depredations of this and other inſects, the crop will not turn out deficient." In another part of his letter, Mr. Markwick, with great probability, conjectures, "that theſe larvæ may feed on the farina, or male duſt of the ſtamina, and poſſibly prevent the proper fertilization of the piſtil in ſuch a manner as to occaſion the future grain to be ſhrivelled and imperfect."

In addition to the foregoing remarks, I can only ſubjoin a few obſervations of my own on the ears of wheat ſent me by Mr. Markwick, and let Mr. Kirby's accurate and valuable experiments follow as a ſeparate paper. On cloſe examination of a number of ears, I found from two to ſix grains inhabited by the larvæ, as repreſented in Tab. 22. fig. 10. a. in the 3d vol. of the *Linnæan Tranſactions*, except that the number of the larvæ was greater in many of them, and in one or two I found what appeared to be a pupa. Having incloſed ſeveral of thoſe ears in large phials, with gauze over the mouth, I ſoon perceived that they became covered with mould, and the larvæ quitting them fell to the bottom of the phials and periſhed. I then procured one of the chimnies made uſe of for Argand's lamps, in which I incloſed ſome other ears, covering each end with gauze: by this means a free circulation of air being permitted to paſs through, the corn remained clean, and the little animals have not quitted their ſituation; which leads me to conclude that they will change into the pupa ſtate, as many appeared to have done that were left in the box in which they came, ſo that I have great hopes of breeding the fly at the proper ſeaſon of the year, which I preſume is now approaching. The figure from Mr. Markwick's drawing, repreſented in Tab. xix. No. vi. fig. 2. agrees in general with the deſcription of *Tipula Tritici*

Tritici of Mr. Kirby, and perhaps may prove to be the different ſex; or it is poſſible that Mr. Kirby might have taken his inſect immediately on its quitting the pupa ſtate, and before the wings were completely dry, ſo that the obſolete clouds with which they are marked had not become viſible. The manner in which both theſe Gentlemen met with this fly leaves very little doubt in my mind of its being the true parent of the larvæ we have deſcribed; and this opinion is very much ſtrengthened by the very great affinity there ſeems to be between our *Tipula* and the *Tipula Juniperina* of Linnæus, and *Tipula Pini* of the Baron De Geer, Tom. vi. p. 417. Tab. xxvi. fig. 8—19; it however differs in colour from the Latin deſcriptions of thoſe inſects, although it agrees in the other particulars. But the long French deſcription which De Geer gives of *Tipula Pini*, varies very little from that of our inſect; and the figure, being uncoloured, would paſs for it very well, as the antennæ and wings ſeem exactly to correſpond: even the account of the larva is nearly the ſame, except that he remarks a thin green line paſſing through the body of his, which he conjectures to proceed from the food, viz. the leaves of the pine; if this be the fact, ſuch a line would not be viſible in our larvæ, as they feed on the pollen of the wheat, which is nearly their own colour: another difference is, that the larvæ of *T. Pini* form little reſinous caſes to preſerve themſelves during the Winter; but both continue unchanged until Spring, as appears by Mr. Kirby's opening one of the caſes, which he ſuppoſed contained the pupa, and finding the larva unchanged, from which I conclude that we have not yet ſeen the pupa. The flies of *T. Juniperina* and *T. Pini* do not come forth until May, which time will exactly ſuit our little animal for depoſiting its eggs in readineſs for the bloſſom of the wheat; and from the appearance of ſome of the little caſes which I have by me, that are ſo tranſparent as to admit of a perfect view of the larva, I am of opinion that they are approach-

ing to the pupa ſtate, as the maggot becomes more white and opake, and is evidently ſhrunk in length. Another circumſtance mentioned by the accurate De Geer, that unites them ſtill more cloſely, and confirms my conjecture of the two ſexes, is the difference between male and female; for he ſays, *Fœminæ alæ nigricantes*, agreeing with the clouded wings in our figure, and at the ſame time confirming Mr. Kirby's deſcription of his. In ſhort, ſo nearly are theſe inſects allied, that I ſhould have little heſitation to pronounce them the ſame, had they not fed on plants ſo very different in their nature and properties. The *Ichneumon Tipulæ* of Mr. Kirby has been ſo fully obſerved by all parties, that it requires nothing to be added here. I can only now obſerve, that the difficulty of inveſtigating and fully exploring the ſecret works of the Creator muſt be my apology for ſtill offering imperfect hints inſtead of a complete hiſtory, but I have done ſo with a view to excite other labourers to favour us with their communications and experiments; for, to uſe the words of my valuable friend Kirby, "If we can advance one ſtep, it is ſomething; and who can entirely remove the awful veil that conceals from mortal eyes the full beauty of the face of Nature, that envelopes in darkneſs her ſecret operations? To get now and then a glimpſe of the footſteps of him who is 'wonderful in working' is all that we can expect. The united force of ſuch obſervations, like rays collected by a lens, which, although when ſeparate they operate but ſlightly either as light or fire, will in time illuminate a ſubject, and make us ſee clearly in what darkneſs we were before. To collect theſe ſeparate rays is the office of the *Linnæan Society*, by whoſe means the light which each conveys is caught ere it be diſſipated, and thus many myſteries of Nature are elucidated, which otherwiſe might for ever have remained in obſcurity."

XX. *Hiſ-*